

Sonobuoy Characteristics
Programming the EFS
Command Function Select (CFS)
Automatic Gain Control (AGC)
Sonic Frequency Response
Technical Data
Logistics Data

AN/SSQ-53E Sonobuoy Characteristics.

The AN/SSQ-53E 'DIFAR' sonobuoy, see Figure 53E-1, is a passive acoustic sensor used to detect and track a submerged submarine. Upon water

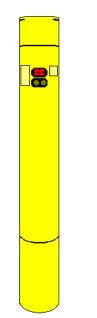
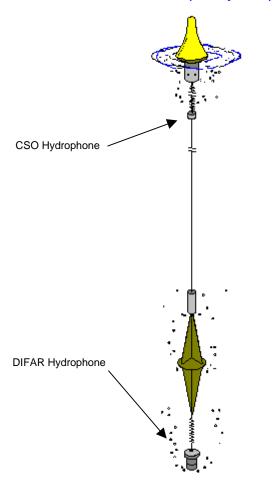


Figure 53E-1. AN/SSQ-53E Sonobuoy.

entry the sonobuoy deploys a passive directional hydrophone to depths of 90, 200, 400 or 1000 feet, see Figure 53E-2. The sonobuoy is programmed prior to deployment through use of the electronic function select (EFS) circuitry accessed through the side of the SLC (see Programming the EFS.) This buoy also introduces the 'constant shallow omni' (CSO) omnidirectional hydrophone. The CSO hydrophone deploys to a depth of 45 feet. The AN/SSQ-53E incorporates command function select (CFS) capability. This capability allows the operator on CFS-capable aircraft to toggle sonobuoy VHF transmitter power on and off, change the RF channel, turn automatic gain control (AGC) on (fast or slow) and off, switch between the DIFAR hydrophone and the CSO hydrophone, and change the buoy life selection after buoy deployment. The EFS is used to program the buoy prior to drop, the CFS is used

to change the programming after drop. CFS commands for the AN/SSQ-53E are

listed in Table 53E-2. Technical data can be found in Table 53E-3. Sonic frequency response for the AN/SSQ-53E DIFAR and CSO hydrophones can be found in the Sonic Frequency Response section.



All AN/SSQ-53E sonobuoys are equipped with helicopter-safe parachute descent retardation. The AN/SSQ-53E began production in 1998 and was made by Sparton Electronics, Hermes Electronics and Undersea Sensor Systems, Inc. Logistics data for the AN/SSQ-53E can be found in Table 53E-4.

WARNING

AN/SSQ-53E sonobuoys contain compressed gas cylinders (CO₂ cartridges) for use in floatation bag inflation. Disassembly of the sonobuoy could result in discharge of the gas cartridge and injury to personnel.

Figure 53E-2. AN/SSQ-53E Deployed.

WARNING

Sonobuoys that contain lithium batteries are potentially hazardous. Unauthorized tampering or handling of the lithium batteries that power the EFS circuitry can result in injury. Lithium batteries shall not be pierced, crushed, burned, dropped, cannibalized, dismantled, modified, carelessly handled, short-circuited, charged, recharged, nor used for any purpose other than their intended use. See the Safety Summary.

Command Function Select.

The AN/SSQ-53E incorporates Command Function Select (CFS) capability into the sonobuoy. This capability allows the operator on CFS-capable aircraft to command the sonobuoy to toggle sonobuoy VHF transmitter power on and off, to change the RF channel, to toggle AGC on (AGC Fast & AGC Slow) and off, to change the operating sensor, and to change the operating life after buoy drop. Table 53E-2 lists the AN/SSQ-53E CFS commands. CFS capability does not eliminate the requirement for EFS. EFS allows programming of the buoy prior to drop. CFS allows sonobuoy options to be changed after the sonobuoy has been deployed and has begun operation. Detailed discussion of the CFS downlink instruction set format is beyond the scope of this publication. Certain data of use to the operator is provided below:

- The sonobuoy will respond to valid CFS commands regardless of whether the VHF transmitter is on or off. (e.g., the operator can change the RF channel, depth, or sonar channel even if the VHF transmitter is turned off.)
- 2. Upon receipt of a valid CFS command, the AN/SSQ-53E will respond with an aural tone of 800 Hz (± 100 Hz) for one second. If the VHF transmitter is off due to a previous CFS command and a valid CFS command is sent to the buoy, the command is executed but the buoy will send no acknowledgment tone. The sonobuoy will not acknowledge or execute an invalid command.

| Table 53E-2. AN/SSQ-53E CFS Commands. | | |
|---------------------------------------|--|--|
| COMMANDS | SELECTIONS | |
| RF POWER | ON (1.0 watt), OFF | |
| RF CHANNEL | 1 through 99, except 57, 58 & 93 | |
| ACOUSTIC GAIN / AGC | AGC OFF, ON SLOW (A1), ON FAST (A2) (Default = AGC Slow if Fast Selected) | |
| MODULATION INPUT | DIFAR, CSO | |
| LIFE | 0.5, 1, 2, 4, or 8 hours | |

Automatic Gain Control (AGC)

NOTE

All AN/SSQ-53E and AN/SSQ-53F sonobuoys were made with the Fast AGC selection inoperative. If Fast AGC is selected on these buoys, the buoy defaults to Slow AGC. Future versions of this model will have the Fast AGC circuitry activated. Monitor the Sonobuoy Web Site for updates.

| Table 53E-3. AN/SSQ-53E Technical Data. | | |
|---|---|--|
| DESCRIPTION | Passive Directional (DIFAR), CFS & CSO Capable | |
| SPECIFICATION | Production Sonobuoy Specification (PSS) for SSQ-53E dated 15 Oct 96 | |
| MAXIMUM WEIGHT | 29.0 lb (13.2 kg) Bare 34.0 lb (15.45 kg) in SLC | |
| ACTIVATION TIME (AFTER SPLASH) | 0.5 watt @ 60 sec 1.0 watt @ 180 sec | |
| TRANSMITTER | RF Channels 1 - 99, selectable (Except 57, 58 & 93) | |
| RF POWER | 1.0 watt | |
| POWER SOURCE | Lithium, non-regulated (EFS), Sea-Water Battery | |
| OPERATING DEPTH | 45 feet CSO 90, 200, 400 or 1000 feet | |
| DESCENT TIME | CSO = 40 sec 90 ft = 40 sec, 200 ft = 65 sec, 400 ft = 100 sec, 1000 ft = 180 sec | |
| FULLY STABILIZED | Descent time + 1 min | |
| SENSOR TYPE | 2 directional, 1 omnidirectional | |
| HORIZ. DIRECTIVITY | 2 axis, cosine | |
| VERT. DIRECTIVITY | Cosine | |
| POSITION MARKER | None | |
| OPERATING LIFE | 0.5, 1, 2, 4 or 8 hrs | |
| SCUTTLE | 8 - 30 hrs | |
| LAUNCHERS | Internal free fall; internal or external CAD launch; pneumatic; over-the-side | |
| LAUNCH ENVELOPE | G-3 | |
| OPERATING ENVIRONMENT - LAUNCH AIR TEMP - SEA WATER TEMP - MAX SS - MAX ALT/IAS | -20° C to +55° C 0° C to +35° C SS 5 | |
| - WIAA ALIMAO | 1,850 ft; 370 KIAS | |

| Table 53E-4. AN/SSQ-53E Logistics Data. | | |
|---|------------------------------------|--|
| NALC | 8W84 | |
| NSN | 5845-01-444-0711 | |
| RETARDATION ¹ | HSP | |
| MANUFACTURER ² | HE, SP, US | |
| RF CHANNELS | 99 SELECTABLE (Except 57, 58 & 93) | |

NOTES:

- 1. HSP = Helicopter Safe Parachute
- 2. HE = Hermes, SP = Sparton, US = Undersea Sensor Systems, Inc (USSI)

NOTE

All AN/SSQ-53E and AN/SSQ-53F sonobuoys were made with the Fast AGC selection inoperative. If Fast AGC is selected on these buoys, the buoy defaults to Slow AGC. Future versions of this model will have the Fast AGC circuitry activated. Monitor the Sonobuoy Web Site for updates.

WARNING

The end cap of certain AN/SSQ-53E sonobuoys may be deformed when removing the unit from the bayonet-base pallet if the wrong breakout tool is used. A deformed end cap may block the anti-rotation lock in the sonobuoy launch tube and allow the sonobuoy and SLC to drop out of the aircraft while inflight. Insure that the AN/SSQ-53E is removed from the bayonet-base pallet by hand or by using the approved bayonet-base pallet breakout tool.

CAUTION

Certain AN/SSQ-53E sonobuoy designs are particularly susceptible to tip-over damage. Use caution when loading and unloading aircraft and do not leave the buoy unattended when in the muzzle (end cap) end down orientation, standing on the deck.

Links:

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AN/SSQ-53E Electronic Function Select

The AN/SSQ-53E electronic function select (EFS) circuitry, Figure EFS-4, allows the operator to program sonobuoy RF channel, operating life, depth, operating sensor, and AGC mode selection settings electronically instead of mechanically. The EFS provides a wider range of RF channel selection over the older fixed-channel sonobuoys and simplifies inventory management by reducing the number of stock numbers associated with a sonobuoy type. The EFS must continue to operate through at least 50 selection cycles (30 - 60 seconds long) per the AN/SSQ-53E specification.

CAUTION

The EFS must function through at least 50 cycles of selection. This should be sufficient for most Fleet situations, but unnecessary operation of the EFS should be avoided as it may deplete the EFS battery charge and make the sonobuoy unusable.

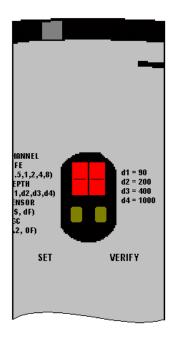


Figure EFS-4. AN/SSQ-53E EFS.

AN/SSQ-53E EFS Operation. On the side of each sonobuoy, visible through the sonobuoy launch container (SLC) via clear plastic 'windows' near the muzzle end, are the EFS buttons and readout, see Figure EFS-4. The digital readout is a light emitting diode (LED) located above the two buttons, and is made up of two seven-segment digital readouts. The buttons are positioned next to each other in the horizontal plane; the left

button is the "SET" button and the right button is the "VERIFY" button. The SET button is depressed to cycle through the RF channel, life, depth, operating sensor, and automatic gain control (AGC) mode selections. The VERIFY button is used to verify the selections made with the SET button. When the EFS is initiated by depressing the SET button it allows the operator to set the RF channel (channel 1 to 99) first, the operational life (0.5, 1, 2, 4 or 8 hours) second, the depth selection (90, 200, 400 or 1000 feet) third, the operating sensor (CSO or DIFAR) fourth, and the AGC mode (AGC ON FAST, AGC ON SLOW, or AGC OFF) fifth. If the VERIFY button is pushed after the depth selection is made, instead of selecting the sensor with the SET button, the sonobuoy will revert to its previous settings (the last time it was fully programmed) and may appear to malfunction upon deployment. Table EFS-4 lists the EFS set cycle.

CAUTION

If the operator abandons the selection sequence after selection of the operating depth without pressing the VERIFY button or proceeding to the sensor mode selection the buoy will revert to its previous settings (the last time it was fully programmed) and may appear to malfunction upon deployment.

Upon depressing and releasing the SET button for the first time, EFS circuitry power is applied and the LED readout "Tens" digit (the left hand digit) begins to cycle from '0' to '9' in one second increments. Upon reaching the desired number, the operator depresses and releases the SET button again, freezing the Tens digit at its current number and starting the "Ones" digit (right hand digit) cycling from '0' to '9' in one second increments. Upon reaching the desired number in the "Ones" digit position, the operator presses and releases the SET button freezing the "Ones" digit at its current number. This concludes the RF channel selection.

After the RF channel has been selected, the life selection begins to cycle through the possible selections in one-second increments. Selections are 30 minutes and one, two, four or eight hours. The LED readouts will illuminate with '0.5' (30 minutes), '1.0' (one hour), '2.0' (two hours), '4.0' (four hours), or '8.0' (eight hours.) Depressing the SET button while the desired life is illuminated sets the life. This concludes the life selection operation.

One second after the life selection is set, the depth selection begins to cycle through 90 feet, 200 feet, 400 feet or 1000 feet in one-second increments. The LED readout will illuminate with "d1" for 90 feet, "d2" for 200 feet, "d3" for 400 feet, and "d4" for 1000 feet. Depressing the SET

button while the desired depth code is illuminated sets the depth. This concludes the depth selection operation.

The EFS numerals begin to cycle through the 'Operating Sensor' selections of constant shallow omni (CSO) or DIFAR ('CS' or 'dF'.) If the operator depresses the VERIFY button at this point, instead of depressing the SET button to select the 'Operating Sensor,' the buoy will revert to the operating sensor and AGC mode it was last set to plus the RF, life and depth selections just made. It is strongly recommended that the EFS be fully programmed rather than using the VERIFY button at this point in the programming sequence. If the operator depresses the SET button at this point in the programming sequence to specify what 'Operating Sensor' is used, that sensor is set and the AGC mode must also be selected. This concludes the 'Operating Sensor' selection operation.

The EFS cycles through the AGC modes (Off, Fast AGC on, or Slow AGC on) in one-second increments. The LED readout will illuminate with "OF" for AGC off, "A1" for Fast AGC on, and "A2" for Slow AGC on. Depressing the SET button while the desired AGC mode is illuminated sets the AGC mode. AGC mode selection should be governed by expected ambient noise conditions on station and in accordance with the brief by the local ASW Sector Commander. Note that in the AN/SSQ-53E the AGC defaults to Slow AGC even if Fast AGC is selected. Fast AGC will become functional in future contracts and versions of the SSQ-53. This concludes the AGC mode selection operation.

NOTE

In the AN/SSQ-53E the AGC mode, if selected on, defaults to AGC Slow even if AGC Fast is selected

Setting the EFS normally takes the operator from 30 - 60 seconds. The RF channel number, life, depth, operating sensor and AGC mode selections set in the EFS will be retained in sonobuoy memory for at least 48 hours per the specification. The VERIFY button is used to review and verify settings made in the EFS. Depressing the VERIFY button causes the contents of memory to be displayed on the EFS readout for three seconds and restarts the 48 hour retention period. Specifications call for the EFS circuitry to function for a minimum of 50 "Set" cycles and 100 "Verify" cycles before battery exhaustion.

| Table EFS-4. AN/SSQ-53E EFS 'SET' Button Function. | |
|--|---|
| SET Switch Depression Number | Function |
| 1 st | Activates EFS, displays '0' in 'Tens' digit, begins cycling of 'Tens' digit. |
| 2 nd | Sets 'Tens' digit with displayed RF channel number. Begins cycling of 'Ones' digit. |
| 3 rd | Sets 'Ones' digit with displayed RF channel number. Starts cycling of 'Life' selections (0.5, 1, 2, 4, or 8 hours). |
| 4 th | Sets 'Life' selection. Starts cycling of 'Depth' selections (90, 200, 400, or 1000 feet). (d1, d2, d3, or d4) |
| 5 th | Sets the depth selection. Begins cycling through 'Operating Sensor' (CS or dF) selections. |
| 6 th | Sets 'Operating Sensor.' Begins cycling through AGC setting (OF, A1, or A2) |
| 7 th | Sets AGC status. Displays RF, life, depth, operating sensor, and AGC mode selections for 3 seconds, loads into memory, turns off EFS power. |

NOTE

In order to change the RF channel, life, depth, operating sensor, and AGC mode setting of the sonobuoy, all settings must be entered. If only one element is changed and then the change process abandoned - the EFS will revert to its previous settings after approximately one minute.